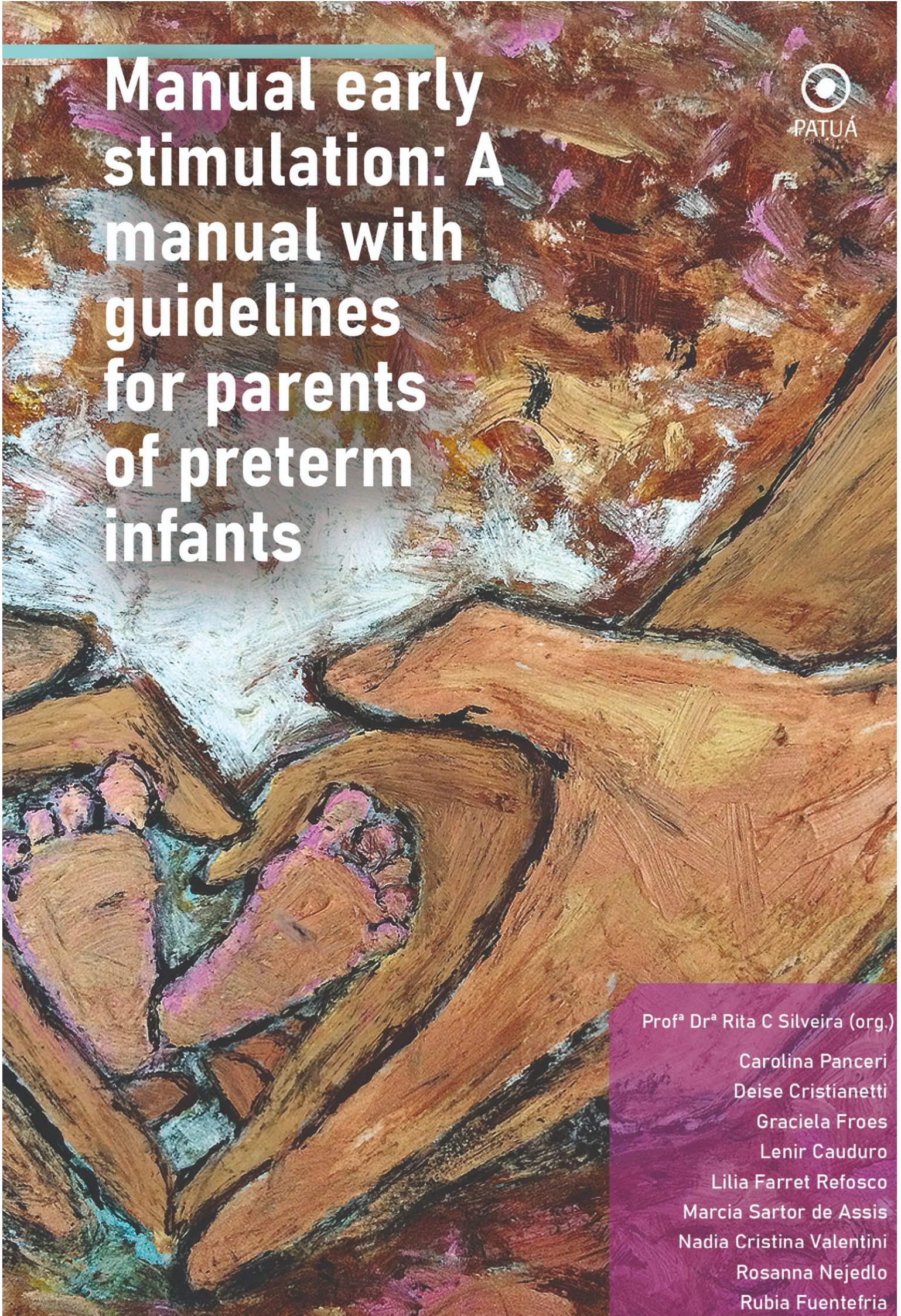
Manual early stimulation: A manual with guidelines for parents of preterm infants



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MANUAL
EARLY STIMULATION: A MANUAL WITH GUIDELINES FOR PARENTS OF PRETERM INFANTS

AUTHORS: RITA DE CASSIA SILVEIRA AND COLLABORATORS

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EDITORA

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AUTHORS: RITA DE CASSIA SILVEIRA AND COLLABORATORS

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Manual_E-BOOK.indd 4 26/10/2021 17:02:58

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Manual_E-BOOK.indd 5 26/10/2021 17:02:58

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To Renato, my partner of all moments: in love,
in life, in art, in science! He is my great supporter!
This construction exists from the foundation,
thanks to your inspiring posture.

Manual_E-BOOK.indd 7 26/10/2021 17:02:58

Manual_E-BOOK.indd 8 26/10/2021 17:02:58

Summary

1.	Introduction	10
2.	The importance of early stimulation and the family at the center of care	14
3.	Systematic Guidelines: appointment 1	18
4.	Systematic Guidelines: appointment 2	26
5.	Systematic Guidelines: appointment 3	34
6.	Systematic Guidelines: appointment 4	42
7.	Systematic Guidelines: appointment 5	46
8.	Systematic Guidelines: appointment 6	56
9.	Systematic Guidelines: appointment 7	64
10.	Systematic Guidelines: appointment 8	72
11.	Systematic Guidelines: appointment 9	80
12.	Systematic Guidelines: appointment 10	88
13.	The impact of early stimulation on neurodevelopment	96
14.	The impact of a mother-child interaction' early stimulation on family daily life	100

1 Introduction

This guidebook for parents of preterm infants originated from a long clinical experience of prematurity and the knowledge that preterm babies are a particular group, with potential risk regarding the interaction with their parents. It is not hard to understand the situation since all the procedures they undergo during the hospital stay separate them from the first essential contacts and bonding with parents; damaging the parent-infant interaction. Health professionals are currently aware of enabling maximum interaction between families and hospitalized infants. However, a hospital environment with monitors, different devices, and an incubator can be frightening, initially, for mothers and fathers.

We know that, with the evolution of neonatal care, preterm infants with lower gestational age (very preterm) can survive after long period in neonatal care, far from home and from the care that other infants, who are born when they are due to, can receive from their families. When preterm babies can finally go home, they still need special care to adequately growth, aquire skills, and develop their full potential.

In all these years, it became clear that better-prepared families with safer care could raise children with significantly better developmental outcome than uninformed families or families with difficulties interacting. It was also realized that parents that did not fear participating in the care their infant needed within the neonatal intensive care unit (ICU) felt more secure after the hospital discharge.

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In all these years, it became clear that better-prepared families with safer care could raise children with significantly better developmental outcome than uninformed families or families with difficulties interacting. It was also realized that parents that did not fear participating in the care their infant needed within the neonatal intensive care unit (ICU) felt more secure after the hospital discharge.

The major challenge for a pediatrician and her team, all passionate about their mission, is to scientifically prove that something we believe and take for granted is, in fact, scientifically proven by research and that it can be implemented without spending great economic resources. Love and patience are the greatest resources. Teaching patience with these hurried little ones, love, and respect for the limits and time of each one of these tiny patients, according to the skills they acquire in the first years of life, is critical.

It was not easy to develop the guidelines we created, with a detailed description of the stimulation intervention. We organize exercises and games, not only motor, but also cognitive stimuli, which resulted in the present guidelines that respects the child's evolutionary stage. This guideline was designed for the child moment of more remarkable brain plasticity, that is, a life stage of significant recovery of brain functions, and additional training of the brain resources for better developmental performance. We use a friendly and straightforward language, so that families could understand, in addition to health professionals, that they could be partners in this activity, complementing and reinforcing each moment of stimulation.

Manual_E-BOOK.indd 11 26/10/2021 17:02:58

The guidelines for parents and family members to conduct the stimulations are divided into ten appointments or steps, which correspond to the first 18 months after the infant's hospital discharge. The first stage corresponds to the first two months of age corrected for the degree of prematurity and, so on, up to 18 months of corrected age. According to the infant's evolutionary stage, the stimuli must be global, anticipating the expected motor and cognitive skills for each stage of child development by one month.

Manual_E-BOOK.indd 12 26/10/2021 17:02:58

2 The importance of early stimulation and family at the center of care

Children born pretermly show a higher possibility of falling behind their peers born at term regarding their working memory and speed of processing information in adult life. There are multiple situations to which preterm infants are vulnerable, neurological problems and injuries, growth deficit, psychiatric problems, visual and hearing impairment, gross and fine motor skills and language. Developmental delay is directly related to the degree of prematurity. That is, the more preterm the infant, the greater the risk of severe delays. If an adequate intervention program is not established, children will not improve with age, with possible adverse effects on future academic performance. For these reasons, systematic developmental monitoring is essential for all preterm infants at all times, especially right after hospital discharge.

All interventions made to improve the parental relationship, focusing on the parents' sensitivity of parents, have appropriate timing for each stimulus to the vulnerable child, adapting it to the infant's needs, tend to influence better cognition, motor skills, and social development. However, family autonomy and family responsibility must be respected in the construction of a parenting model. In a robust guidance system for early stimulation, families are trained to autonomously deal with the children who need the most exceptional care. Parents' abilities to solve and seek practical solutions in daily life are

Manual_E-BOOK.indd 14 26/10/2021 17:02:58

encouraged through systematic guidelines, which often also rely on the support of health professionals in a complementary multidisciplinary approach but not dissociated from family-centered care.

Systematic guidelines do not have a purely instructive role; they follow the model of primarily offering support to parents and/or main caregivers to develop a partnership to nurture better infant development, according to the abilities of each child. Each family may discover their skills, coping strategies, desires and goals with the stimulation activities and emotional support continuously offered.

The family needs to be engaged, actively participating in achieving the desired effect on child development. Some preterm children may also need follow-up with professionals trained to provide specific stimulation or corrections of motor retractions and impairments already established. This strategy reinforced the need for partnerships with health teams and continued care by the family. We should not just tell the family what or how to do it but help them figure out how to nurture their infant correctly. Every family is unique, and every child is unique. For this reason, these guidelines, presented in ten topics to be developed by parents or family members, are suggestions to help each family explore and seek alternatives, deciding how they would like to get involved in the suggested interventions.

The early stimulation program should be started right after discharge and according to the hospital dynamics, even in neonatology environments. The literature on neuroplasticity suggests that intensive interventions, with specific tasks, should

Manual_E-BOOK.indd 15 26/10/2021 17:02:58

start as soon as possible and in an enriched environment during the critical period of neural development, to make the best use of the brain's ability to reorganize its neural connections, responding to learning experiences.

Understanding the brain development in preterm children is still preliminary, especially when there are alterations in neuroimaging exams. Regardless of the child's involvement, a continued and early stimulation treatment will be essential to block or reverse neuropathological changes. When stimuli are part of daily care, even for children with major disabilities, there are benefits in brain motor skills, behavior, and emotions.

Manual_E-BOOK.indd 16 26/10/2021 17:02:58

3

Systematic Guidelines: appointment 1

From the first moment, family members must be instructed to bond with the child, gaze carefully at the child during all activities, without television, telephone, or text messages. The touch should be soft and light as a cuddle, these are the general presuppositions of the first appointment.

First, place the child on his back inside a nest that can be set up with blankets. With the distance of a hand to the face, the orientation is to capture the child's gaze. The gazing should be prolonged and always talk to the child.

When talking to the infant, the language used should be "mommy talk" - communication with a soft, smooth voice, in a musical tone, and full of a warm feeling. This way of speaking is a way to guide the child's language. "Mommy talk" has several vibrant tones and inflections, like a symphony or a virtuous orchestra for the child's ear.

Still in the nest, in the next activities, the child's arms should be moved and bring to the center of the body so that one hand touches the other. When the hands' touch, open the little arms, stretching them until the hands touch the surface.

Move the child's legs, bending them until the knees touch the tummy, then stretch them until the feet touch the surface. Move the child's legs, this time, bend one at a time. While one leg is bent, the other leg must be straight, alternate the movements by imitating the movement of a small bicycle.

Repeat the exercises about 10 times and while the child is enjoying the activity. If the child cries or gets tired, the activity should be stopped and started at another time of day. The child must be alert, calm, comfortable, and well-fed to perform these activities. Therefore, the ideal time is about one hour after feeding.

The fear of laying the child on their back without elevating the head by approximately 30 degrees is very common among parents due to a possible physiological gastroesophageal reflux. Remember that this activity is quick and distant from feeding time, so it will not risk aspirations and small regurgitations.

After a week of doing these initial activities, exercises 5 and 6 are added. In exercise number 5, the child is placed on their side, and the roller is placed on their back. Encourage one hand to touch the other calmly, and smoothly. The position should be performed with the child lying on their right, and then the activity is repeated for the left side. Perform it ten times on each side.

In exercise 6, the child may be a little tired, so the orientation is to lie on your back on the bed, position the child's tummy in your chest, encourage eye contact, exchange glances, and always talk and sing. This last activity in step 1 has no defined duration; it varies according to the disposition of the mother-child or daddy-child pair.

Manual_E-BOOK.indd 19 26/10/2021 17:02:58

See the chart illustrating appointment 1 with the exercises to be conducted routinely, for about a month or a month and a half. Note that all the moments and possibilities for interaction can be part of the family daily activities. Siblings can also participate in the activities.

Manual_E-BOOK.indd 20 26/10/2021 17:02:58

1st appointment

Bond with your Baby:

GAZE: 10-inch distance / **TALK:** "Mommy talk" / **TOUCH:** Light and gentle
In all daily activities.

1

- Place the child in the nest, faced up, to perform the activities

3

2

- Practice mutual gaze and talk to the child, trying to keep eye con tact for periods of time.

- Move the child's arms, closing them to the center of the body, until their hands touch.

- When the hands touch, open the child's arms, until the hands touch the surface. Repeat 10 times, if the child is enjoying the activity.

continued

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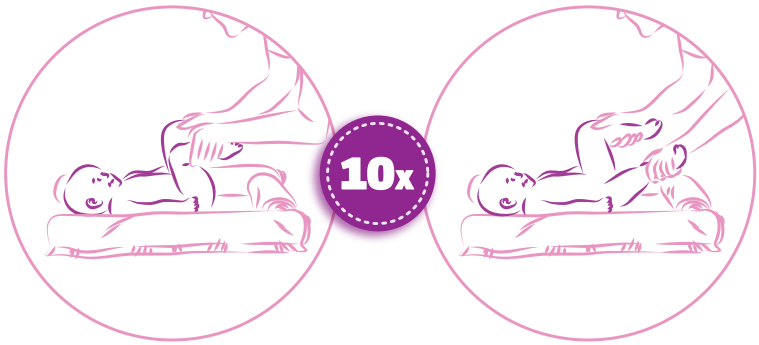


5

- Place the child on his/her side, placing a roller on his/her back. Stimulate one hand to touch the other.
- Perform this position with the child lying on his/her right, and then on his/her left.

General guidelines:

The baby must be alert and calm.

1x Perform activities once a day

- Move the child's legs by flexing them until the knees touch the tummy. Then stretch them until their feet touch the surface.
- Move the child's legs, flexing one at a time. While one is flexed, the other must be stretched out. Alternate movements, simulating a small bicycle.
- Repeat 10 times, if the child is enjoying the activity.

6

- Lie down on the bed, on your back, and place the child faced down on your chest.
- Encourage eye contact by talking and singing to the child.

ce

One hour after feeding

4 Systematic Guidelines: appointment 2

In the second visit, it is often noticed that the muscular control and motricity improves, provide the child with head support. When the infant can hold his head steady, it is possible to perform some activities that encourage cervical lateralization, sense of direction, and horizontal gaze.

In the illustrative chart shows that right at the beginning, activity 1 occurs precisely as in the previous step. Then follows the exchange of looks with the child and the with the famous "mommy talk" conversations. Maintaining eye contact for a long time is a permanent orientation with a significant impact on cognitive aspects.

Activities 3 and 4 are repeated in step 2, but in a more demanding way than in step 1. When moving the child's little arms, bring them to the center of the body so that one hand touches the other with the five fingers aligned to the center of the body, fully stretching the little arms after the touch. In addition to the hand-to-hand touch, encourage the child to bring their hand to their mouth until this movement occurs spontaneously. The child's leg movements will be more agile at this stage, and the bicycle-like movement will be faster and more synchronized. As the infant's evolution is observed, the enthusiasm for maintaining the series of activities increases. Mother, father, or grandparents will notice the child's evolution.

Manual_E-BOOK.indd 26 26/10/2021 17:03:01

In activity 5, in the supine position, the auditory and visual potential stimulation begins, offering a rattle, stimulating the child to look at it and follow its movement with its noise. It is suggested to provide a mobile to promote the child's gaze. Those who do not have a mobile do not need to be worried, as a simple rattle is not expensive and works very well.

Place the child on his side, support his back with a roller, maintain the stimulation of hands' touching, and with the rattle, a strong distractor attractor of attention, stimulate the child. By reinforcing that the child looks at the rattle while trying to join his hands in the midline, the two cerebral hemispheres are stimulated in a complementary way. The right hemisphere is focused on novelty and creativity, and the left hemisphere on routine and following activities. Remember to perform this position with the child lying on their right side and then on their left (activity 6 on the illustrative chart).

In activity 7 the rest and conversation time is like step 1; but longer. The act of singing already involves the child's participation, which must start paying attention to the lip movements.

Activity 8 of the second stage is very challenging: place the child in his tummy on the bed, with a roller under

Manual_E-BOOK.indd 27 26/10/2021 17:03:01

the chest at the height of the nipples to support the trunk since the child is not yet strong enough to support his weight. Head elevation should be encouraged, with exciting conversations, call the child by his/her name and give very enthusiastic "squeals", such as: "Look who is here, it is me, honey!" The goal is to keep the child interested in searching for the voice of the caller.

All activities should be repeated about 10 times, if the child shows comfort and enjoys the activities.

Manual_E-BOOK.indd 28 26/10/2021 17:03:01

2nd appointment

Bond with your Baby:

GAZE: 10-inch distance / **TALK:** "Mommy talk" / **TOUCH:** Light and gentle
In all daily activities.

1

- Place the childin the nest, faced up, to perform the following activities.

3

4

2

- Practice mutual gaze and talk to the child, trying to keepeye contact for periods of time.

- Move the child's arms, closing them to the center of the body, until his/her hands touch.
- When the hands touch, open the child's arms, stretching them.
- Repeat 10 times, if the child is enjoying the activity.
- Encourage hand-to-hand and hand-to-mouth touch.

- Move the child's legs by flexing them until the knees touch the tummy.
- Move the child's legs, flexing one at a time. While one is flexed, the other must be stretched out. Alternate movements, simulating a small bicycle.
- Repeat 10 times, if the child is enjoying the activity.

continued

5

- Use a rattle, encouraging the child to keep looking and follow the movement.
- Use a mobile to get child's attention.

7

- Lie down on the bed, on your back, and place the child faced down on your chest.

  Encourage eye contact by talking and singing to the child.

General guidelines:

The baby must be alert and calm.

1x

6

- Put the child on his/her side, placing a roller on his/her back. Stimulate one hand to touch the other.
- Use a rattle to get child's attention.
- Perform this position with the child lying on his/her right, and then on his/her left.

8

- Place the child on his/her tummy on the bed, place a roller under his/herchest, and encourage him/her to lift his/her head.
- Talk to the child, encouraging him/her to follow your voice.

Perform activities once a a day

One hour after feeding

5 Systematic Guidelines: appointment 3

In the illustrative chart of this third appointment, the guidelines for activities 1, 2, 3, and 4 are the same as for appointment 2. Repetition reinforces the skills acquired by the child and transmits confidence to parents and family members. The exercises should be repeated about 10 times and while the child is enjoying the activity.

In activity 5, in the supine position, it is essential, when playing with the rattle, to ensure that there is visual monitoring of the rattle at 180°, without interrupting the stimulation until you can capture the child's gaze. Any difficulty relating to this activity should be reported to the health team and/or pediatrician for a detailed assessment of visual problems (i.e., visual perception or structural problems of vision, such as strabismus or retinopathy of prematurity).

Activity 6 is the same as in the previous appointment; however, when placing the child on his side, placing a roll on his back, it is expected that his muscle tone is already more independent; therefore, the dynamics of touching one hand on the other is more agile and coordinated. Placed the rattle out of reach to encourage dissociate the shoulder and pelvic girdle, maintain the position when searching for the rattle. Both sides must be stimulated.

Manual_E-BOOK.indd 34 26/10/2021 17:03:02

The challenges must be progressive; therefore, this time, placed the child on his/her tummy in the bed, try to do it without the support of the roller. Ideally, the infant will start to support his/her weight in the forearms in the absence of support. When talking, singing, and stimulating with rattles or light up toys, encourage the child to raise the head searching for the sounds or lights; this is an example of motor and cognitive stimuli. For any activity, positive reinforcement using vocal praise, applause, smiles, and enthusiastic interactions produce outstanding results; from the fourth month of life – with the corrected age for the degree of prematurity, there was an enormous understanding on the part of the infant regarding the success to overcome new challenges.

A guideline that is always worth remembering is that each child is unique and choosing the time of day when the child is alert, calm, and willing to interact varies from case to case. We should not overwhelm the child so that his/her get too tired, so it's recommended to do the activities once a day, routinely.

Manual_E-BOOK.indd 35 26/10/2021 17:03:02

3rd appointment

Bond with your Baby:

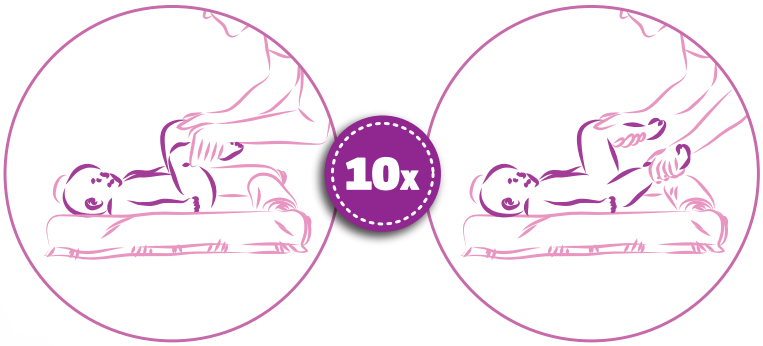
GAZE: 10-inch distance / **TALK:** "Mommy talk" / **TOUCH:** Light and gentle
In all daily activities.

1

- Place the child in the nest, faced up, to perform the following activities.

3

4



2

- Practice mutual gaze and talk to the child, trying to keep eye contact for periods of time.

- Move the child's arms, closing them to the center of the body, until their hands touch.
- When the hands touch, open the child's arms, stretching them.
- Repeat 10 times, if the child is enjoying the activity.
- Encourage hand-to-hand and hand-to-mouth touch.

- Move the child's legs by flexing them until the knees touch the tummy. Then stretch them until the feet touch the surface.
- Move the child's legs, flexing one at a time. Alternate movements, simulating a small bicycle.
- Repeat 10 times, if the baby is enjoying the activity.

continued

5

- Use a rattle to play, stimulating 180° visual tracking.

7

- Without the roller (or still using it, if necessary) on the bed, place the child on his tummy, supported on his/her forearms.
- Encourage the child to lift his/her head.
- Talk to the child and offer a rattle.

General guidelines:

The baby must be alert and calm.

1x

6

- Place the child on his/her side, placing a roller on his/her back.
- Stimulate one hand to touch the other and offer a ratte.
- Perform this position with the child lying on his/her right, and then on his/her left.

One hour after feeding

At the end of these three sections, It is expected to observe some motor and cognitive skills development. Flexion and extension, initially passive and then active, allow spontaneous relaxation of the limbs for activities such as daily bathing, supporting the upper limbs with external assistance and lateral rolling. For cognitive stimulation, talking very slowly, singing, and stimulating the child to turn the head promotes language acquisition and communication skills and concentration.

Manual_E-BOOK.indd 41 26/10/2021 17:03:01

6 Systematic Guidelines: appointment 4

At this stage of life, the quality of the parent-infant bond, more than ever, has a clear impact on development, especially on cognition. The voice of family members when singing and telling children's stories, in addition to the practice of "mommy talk", established early on, became familiar to the child's ears, and initiated the process of imitating sounds, vocalizing, and the emergence of the first linguistic expressions. Therefore from the firsts activities to the following appointment s, when offering a rattle, encourage the child to reach it by verbal invitation, and we should wait for the child's response.

In activity 2, rattles or other noisy and light-up toys, such as bells, are placed in the child's socks; this helps the child's' perception of his/her feet. It is recommended to encourage exploration of the feet, raising the child's legs, and helping them to touch and play with their feet. In this activity, it is recommended talk with the child, said things like: "Look at the foot, is it smelly?" "Is my foot smelling?" "I will sniff your foot." "I will sniff the other foot." "Hey, child (used the child's name): You have two feet...one, two, one two!"

Conversations are critical to hold attention and help in awareness of body parts, which begins around the second semester of the child's life, if the development is typical.

The stimulation to the lower limbs continues in activity

Manual_E-BOOK.indd 42 26/10/2021 17:03:04

3. Now play with a mobile, hanging at feet' height, so that the child tries to touch it with their feet, stimulate them to hold the position and reach. When that goal is reached, celebrate, praise, clap your hands, show satisfaction with each achievement.

It is vital to reinforce previously acquired skills. Recall that in activity 7 - appointment 3, the purpose of maintaining the child on his tummy, without the roller, was to encourage the head's lift and support. This activity is reinforced at this time by offering a rattle or any other toy, which should be done from a certain distance so that the child tries to pick it up out of its reach to play.

The sitting position starts in motor evolution with support. Thus, by positioning the child in a sitting position with support, such as a "sitting pillow", it is possible to provide a horizontal view of the world around them, in addition to motor stimulation of trunk control.

It is worth emphasizing that each daily stimulation must be performed at the best time for the child when he/she is willing to collaborate, is calm, and fed. Families may not quickly realize the gain in child development. However, over time, the child's evolution became more evident and will generate enormous satisfaction for the family, reinforcing the importance of parental involvement, as discussed previously.

Manual_E-BOOK.indd 43 26/10/2021 17:03:04

4th appointment

Bond with your Baby:

Sing to your baby • Imitate sounds and make faces

1

• Use a rattle to encourage the child to reach out for it.

Wait for the child's response.

3

• Play with mobile.

4

General guidelines:

The baby must be alert and calm.

1x

2

- Use socks with rattles to stimulate feet awareness.

- Place the child on his/her tummy, without the roller, and encourage him/her to lift and hold up his/her head.
- Use a rattle to play with the child.

5

- Place the child in a sitting position using a "sitting pillow" for support.

Perform activities once a day

One hour after feeding

7

Systematic Guidelines: appointment 5

In the fifth step or appointment, reinforcements of previously acquired skills with the feet are conducted (activities 1, 2, and 3 on the sheet), with additional challenges. Offer to the child pick up toys with different textures - to recognize the textures, and encourage him/her to pass the toy from one hand to the other hand. It is essential to talk during these activities, explaining each desired movement and identifying each object/toy. The language must be verbal and non-verbal, with demonstrative gestures.

Motor skills are reinforced in activity 4, rolling the child from supine to the tummy position, encouraging them to participate in the activity all the time. Turn the child to both sides. In activity 5, the child's tummy position without the roller is reinforced again. In this position, a rattle is offered, encouraging them to reach for it. Wait for the child's response. Offer objects of different textures for the child to pick up and place them out of reach, at ever greater distances, so that the child crawl to catch them. Avoid overtiring the child to prevent irritation and frustration at some failure.

In this appointment, when positioning the infant in a sitting position with a "sitting pillow" support, better trunk balance is expected, allowing the search for objects out of reach, as shown in the drawing in activity 6. Objects of different textures and a

Manual_E-BOOK.indd 46 26/10/2021 17:03:05

rattle are offered again for the child to pick up and make noises when moving it, creating excitement about the sounds they can produce from their body movements. In the sitting position, with support, the child is encouraged to pass the rattle or the offered object from one hand to the other.

In activity 7, reduce motor agitation, providing a moment of reading and concentration. Note the importance of calmly reading, pronouncing each word very slowly. When naming animals, pronounce their names syllabically and imitate them, explaining to the child. For example: "The cat meows: meow." "The dog barks: woof-woof". Show the picture of each animal in the book while reading.

Bathing is a daily need that provides opportunities for interaction. After the bath, dry the child, saying the name of each part of the body. Dry the tummy, say "tu-mmy", very slowly. The objective of activity 8 is to initiate knowledge of the body as a whole, becoming aware of the human condition. In activity 9, the mirror reinforces this awareness by perceiving that "we are all equal". The mirror (called "magic mirror") has been recognized as essential for many years since the hippocampus is stimulated, so is the child's memory. The recognition of similarities and differences between people helps the identification of the child with his

Manual_E-BOOK.indd 47 26/10/2021 17:03:05

parents. Furthermore, the importance of "eye to eye" contact has already been proven to be relevant for cognition in a pioneering study published in 1974 by a group of neuropsychologists from Harvard University, with only 11 patients.

Manual_E-BOOK.indd 48 26/10/2021 17:03:05

5th appointment

Bond with your Baby:

Sing to your baby • Imitate sounds and make faces

1

- Use a rattle to encourage the child to reach out for it. Wait for the child's response.
- Offer different textures objects and encourage the child to touch them.
- Encourage the child to transfer the rattle or other object from hand to hand.

3

- Play with mobiles.

5

2

- Use socks with rattle, to stimulate feet awareness.

4

- Roll the child from back to tummy, encouraging him to participate in the activity.
- Gently roll the child to both sides.

- Place the child on his/her tummy, without the roller.
- Use a rattle and encourage the child to reach for it. Wait for the child's response.
- Offer the infant to touch different textures objects .

continued

6

- Place the child in a sitting position with support of a "sitting pillow".
- Use a rattle to encourage the child to reach out for it. Wait for the child's response

7

- Read to the child and use repetitive sentences.

9

- Show the child a mirror saying the his/her name and his/her body parts.

General guidelines:

The baby must be alert and calm.

1x

- Offer different textures objects and encourage the child to touch them.
- Encourage the child to transfer the rattle or other object hand to hand.

8

- After the child's bath, dry him/her repeating the name of each body part.

10

- Sing and listen to music with the child.
- Play "peek-a-boo".

Perform activities once a day

One hour after feeding

Activity 10 of this appointment seeks to enhance interactions, such as the desire for oral expression through speech and articulation of words through music. When singing and listening to songs with the child, it is always interesting to repeat the same song, so it is easier for the child to learn and actively participate, often singing along. The "peek-a-boo" or "hide and seek" game is a classic that kids often love. At this point, the infant lies with their back to the bed while the mother, with a towel or piece of fabric, can hide-and-seek; it is a moment of significant interaction and, in time, the infant ends the game, removing the towel and showing functionality to interrupt a cycle. This skill, when acquired (regardless of age), reinforces the child's self-confidence.

Manual_E-BOOK.indd 55 26/10/2021 17:03:07

8 Systematic Guidelines: appointment 6

On the sixth visit, many motor activities are encouraged on the floor, on an EVA mat, as the main objective is to prepare for walking with support and, later, independently. The risk of accidents is lower when conducting the activities in the floor. In activity 1, the child is encouraged to crawl on the floor, looking for out-of-reach toys. In activity 2, the child is encouraged to roll into the tummy position, initially with help and then independently. It is essential to encourage the child to roll to both sides, as there is always one side that the child finds easier to do the lateralization exercises.

Activity 3 works the upper limbs and muscle strength a lot. Place the child on his/her tummy with a roller under the hips, encourage him/her to rest his hands on the floor. Move the child back and forth with the roller; it will strengthen the upper limbs.

In activity 4, position the child in a sitting position, preferably without support, encourage the child to hold two objects simultaneously, one in each hand, exchange toys with the mother, playing and socializing. Throughout the activity, sing to your child, imitate sounds, and make faces; encourage the child to do the same, interact and create bonds of affection.

Social interaction also advances with stimuli at this stage of life, which approaches 12 months of corrected age. Reading

Manual_E-BOOK.indd 56 26/10/2021 17:03:07

reinforces the child's attention and concentration. Thus, in activity 5, read sentences repeatedly and slowly to capture the child's attention and promote understanding is very nurturing.

After the bath, when drying the child's body, slowly named each part of their body while pointing to the corresponding part. For example: "Look, we have five fingers: 1,2,3,4 and 5." "The other hand also has 5 fingers." "This foot also has 5 toes, and the other little foot: 5 toes". These guidelines make much sense for the child. In front of the mirror, the mother show and name each body part for the child, such as "eyes, mouth, nose, hair." Say the child's name and her name. Even with the same body parts, the infant needs to be aware of their individuality (activities 6 and 7 on the chart).

In activity 8, the previous game of hide-and-seek is resumed. Always sing along with the child or listen to a song with the child. Up to 6 months, the infant's thoughts are very real. If the object disappears from their vision, it ceases to exist for the child. With maturity, between 6 and 18 months of age, the concept of "object permanence" must be reinforced; parents can play hide and seek or hide toys and encourage the child to look for them. The child is experiencing great discoveries, and curiosity must be stimulated. In addition, playing brings the family closer together

Manual_E-BOOK.indd 57 26/10/2021 17:03:07

and encourages self-confidence and bonding between parents and children. The mother can also hide behind the child's legs while changing their diapers, they love this game and cognition is stimulated.

Manual_E-BOOK.indd 58 26/10/2021 17:03:07

6th appointment

Bond with your Baby:

Sing to your baby • Imitate sounds and make faces

1

- Encourage motor activities on the floor on an foam mat.

3

- Position the child on the foam roller on his/her tummy and encourage him/her to rest his/her hands on the floor.
- Move the child back and forth with the roller.

2

- Roll the baby from back to tummy, encouraging him/her to participate in the activity.
- Gently roll the baby to both sides.

4

- Place the child seated without support, if possible.
- Encourage the child to hold two objects simultaneously, one in each hand.

continued

5

- Read to the child and use repetitive sentences.

7

- Show the child a mirror saying his/her name and his/her body parts.

General guidelines:

The baby must be alert and calm.

1x

6

- After the child's bath, dry him/her repeating the name of each body part.

8

- Sing and listen to music with the child.
- Play "peek-a-boo".

Perform activities once a day

One hour after feeding

9 Systematic Guidelines: appointment 7

The 7 to 12 months of corrected age is a phase in which some simple guidelines are reinforced for the parents. Parents must help the child to learn to locate things by listening to verbal commands. Sing songs when findings toys and putting toys back is another activity essential in this period. Therefore, conduct these activities several times to see if the child crawl to find the sound's source. Among the proposed motor activities, activities 1 and 2 stand out. Sit the child without any support, preferably on a EVA mat, encourage him/her to hold objects (colored balls or cubes, for example), one in each hand, and slam them together, observing the sound they make. Next, it is recommended to encourage the child to clap, wave, and name body parts.

At this stage, the peek-a-boo game is performed with the child seated, providing a horizontal view of the world to the child, this kind of stimulation nourish advances in cognitive development. Pinch movement (thumb and pointer finger) and overall fine motor skills are stimulated by tearing old magazines (activities 3 and 4). It is known that the pinch movement is one of the main skills acquired by the man during the evolutionary process and that it differentiates them from other animal species. The acquisition of this skill is the basis of the writing skill.

Manual_E-BOOK.indd 61 26/10/2021 17:03:11

Floor motor activities on a foam mat were already conducted in the previous appointments, and thus, in the seventh, the objective of activity 5 is to spend more time on the floor, preferably without support devices. It is also essential to encourage the child to be on four support (hands and knees) to crawl (using the roller as support if necessary).

In activity 6, certain bold moves must be allowed and even encouraged. Place the child standing in front of a sofa or bed, instructed his/her to climb the furniture. The father or mother's own body, lying on the bed, can be "scaled" by the child. Often, the child may like to stand with assistance in front of a sofa to prepare for climbing the furniture - encourage them! Give positive reinforcement, clapping, talking enthusiastically, praising the child! Manifestations of verbal enthusiasm are very positive, so the infant gets motivation to reach proposed goals in the future, developing higher self-esteem.

Combining specific motor and cognitive activities is a strategy to avoid the child's fatigue. During the activities 7 and 8, the orientation is to sing songs repeatedly, tell children's stories and talk very slowly, articulating the words clearly. Returning to the mirror activity, show yourself with the child in the mirror, repeat the names of body parts, and point out the similarities

Manual_E-BOOK.indd 65 26/10/2021 17:03:11

and differences between people. Repeat the infant's name and the mother's name, for example: "You are my son Vitor, and I am your mommy, my name is Rita".

At this period, the child enjoys oral feeding. With the child adequately seated in a child seat, something easy to pinch should be offered; the child can take it with his/her hands and take it to the mouth. Breadcrumbs are well suited for this moment. From 8 months of corrected age, this skill is expected to be part of the infant's interest and, for this, the family must encourage it.

The effectiveness of these stimuli depends on how often they are conducted with the child. We recommend that all these activities be performed at least once a day.

Manual_E-BOOK.indd 66 26/10/2021 17:03:11

7th appointment

Bond with your Toddler:

Sing to your baby • Imitate sounds and make faces

1

- Place the child seated without support, if possible, on a foam mat.
- Encourage the child to bang objects together, one in each hand (colored balls or cubes)

3

- Play “peek-a-boo”.

2

- Encourage the child to clap and wave.
- Name his/her body parts.

4

- Encourage the child to scratches or tear up papers/magazines.

5

- Encourage motor activities on the floor, on a foam mat, and talk to the child.
- Encourage a crawling position (with or without the roller).

7

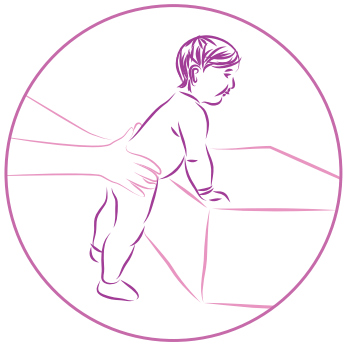
8

- Read to the child and use repetitive sentences.

General

1x

6



- Encourage the child to climb the furniture (couch) or the caregiver's body.
- Help the child to stand up with support.

- Show the child a mirror saying his/hername and his/her body parts

  Also show him/her yourself in the mirror.

9

- Encourage the child to pick up and eat food pellets (brad crumbs).

guidelines:

Perform activities once a day

10 Systematic Guidelines: appointment 8

With the child sitting on a EVA mat, the mother or father can offer a shape-matching box and the matching pieces to the child encouraging the infant to fit the pieces into the corresponding holes. There are several commercially available toy models with this function. This activity requires fine-motor and cognitive skills to understand the shapes and then fit them properly. If the child fails and becomes frustrated, angry, or crying, or shows any sign of impatience, move on to more relaxing activities (2, 3, and 4), in these tasks resume to the first challenge. We suggest, try this activity first, when the child is still not tired. In activities 2 and 3, the child plays without much need for concentration, as they will clap their hands and name parts of the body (previously learned), have a little chat, mumble songs, and play peek-a-boo. In activity 4, the child can hardly tear magazines and be messy if she gets angry or frustrated. In activity 5, it is recommended to place the child on the floor and encourage them to crawl, always talking and explaining each in a ludic way each task within the play.

It is vital for child development that he/she learn to deal with frustrations, thus acquiring, among other life skills, the ability to be tolerant, understandable, and accept the "no". However, it is too early for that. For this reason, when the child fails to perform a proposed activity, it is advised to try again at another time and always say, when he/she fails - "It's ok, no problem".

Manual_E-BOOK.indd 72 26/10/2021 17:03:15

In activity 6, besides encouraging the child to climb furniture (such as a sofa or a bed) and the caregiver's body, parents should help his/her to stand up with and without assistance. Standing without assistance requires a lot of balance and concentration.

The mirror task is repeated in activity 8; parents should show themselves in the mirror with the child and repeat the child's name and body parts several times. It is necessary to encourage the child to speak his/her name, to be aware of herself, strengthen how unique he/she is, and that he/she has a name. Being aware of himself and others – mom and dad, and know his/her own names is vital to the child development. Here, the task does not just involve naming body parts, but his/her name as a person.

In activity 9, the reading stories and repeat sentences should be prolonged; it will require a lot of emphasis on the intonation of words to hold the child's attention. There are times when the family needs a lot of patience and tolerance not to give up, as the child's mind is agitated and disorganized, due to immaturity.

Enjoying oral feeding remains as a reinforcement in this period, the last activity in the proposed package (activity 10). The child should be well seated and without any toys to distract their

Manual_E-BOOK.indd 73 26/10/2021 17:03:15

attention at mealtime. All these activities must be performed at least once a day. As the child enjoys it, he/she will want to do the activity for a longer time, and the mother and father will be able to participate at different times.

Manual_E-BOOK.indd 74 26/10/2021 17:03:15

8th appointment

Bond with your Toddler:

Sing to your baby • Imitate sounds and make faces

1

• Offer the child a shape sorter toy, encouraging him/her to fit the pieces into the right holes.

3

• Play "peek-a-boo"

2

- Encourage the child to clap and wave.
- Name his/her body parts.

4

- Encourage the child to scratches or tear up papers/ magazines.

5

- Encourage motor activities on the floor, on a foam mat, and talk to the child.

7

- Encourage the child to walk sideways with hand support.
- Encourage the child to walk forward with hand support and with a chair or a stroller as support.

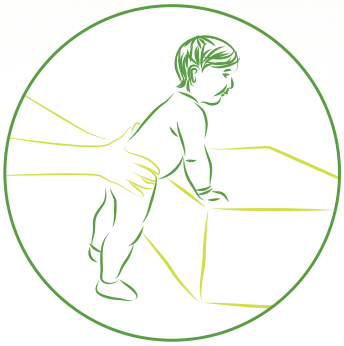
9

- Read to the child and use repetitive sentences.

General

1x

6



- Encourage the child to climb the furniture (couch) or the caregiver's body.
- Help the child to stand up with support.

8

- Show the child a mirror saying his/her name and his/her body parts. Also show him/her yourself in the mirror.

10

- Encourage the child to pick up and eat food pellets (bread crumbs).

guidelines:

Perform activities once a day

11 Systematic Guidelines: appointment 9

Building for legibly writing and clear communication during this development period is necessary. Start with pinch movement training. By offering crayons and encouraging the child to scribble and play with modeling clay (activities 1 and 2), the pincer movement is trained and developed.

All handicrafts, such as playing with sockets, building towers (activity 3), tearing paper, rolling paper balls, transporting materials, drawing, painting, or even throwing newspaper balls, also help acquire the pincer movement. The family should be advised that, for the child to acquire the full potential in legible written communication, not only the fine motor skills, but also all aspects involving knowledge of the body scheme, static and dynamic balance, gross motor skills, upper limbs muscle training are necessary. Encourage the child to turn the pages of books freely while telling stories, as shown in activity 3. Children love to play pretend they can read, imitating adults.

In activity 4, parents should place the child in the child seat for the meal and have him/her hold the spoon to eat. It is a task for which the child may show some resistance at first, as he/she is used to eating with hands. It is essential to advise the parents that they will be helping the child to develop a posture that

Manual_E-BOOK.indd 80 26/10/2021 17:03:19

allows them to hold the objects correctly and put the arm properly on the table when support is necessary, thus encouraging them to continue practice this stimulus daily.

Activities 5, 6, 7, and 8 reinforce broad motor aspects and walk independently. The gradual preparation starts at activity 5 by encouraging the child to walk sideways with hands' support on the sofa and to walk forward with hands' support on a chair or stroller. Continues with activities 6 and 7 which consist of stimulating and mainly helping the child to stand without support. Soon after, the parents should encourage the child to attempt their first steps without support. At this time of interaction, positive reinforcement is critical. Parents should be instructed to applaud and praise a lot the child's achievements and autonomy, and avoid use walkers, which are too dangerous and do not help to walk early.

Between 1 year and 1 year and 2 months of corrected age for the degree of prematurity, the child's curiosity, and the need to explore the environment are enormous, which is very positive and may a sign that early stimulation is helping. At this period, teaching the child to get up and down from the bed and sofa is a procedure that prevents falls and makes the child gain more confidence (activity 8). Parents should constantly be reminded that the great-

Manual_E-BOOK.indd 81 26/10/2021 17:03:19

er their efforts to promote their children's independence, the easier it will be for the child to understand when they need to withdraw attention. So, if the child dares to move up and down from the sofa she/he will feel much safer each time, reducing accidents.

Manual_E-BOOK.indd 82 26/10/2021 17:03:19

9th appointment

Bond with your Toddler:

Sing to your baby • Imitate sounds and make faces

1

- Offer crayons to the child and encouragehim/her to scribble.
- Play withplay dough.

3

- Encourage the child to play with books and turn pages, tell stories.

2

- Play with shape-sorter toys.
- Build towers.

4

- Encourage the child to hold a spoon to to feed him/herself.

5

- Encourage the child to walk sideways with support on the furniture/couch.
- Encourage the child to walk forward with hand support and with a chair or stroller as support.

7

- Encourage the child to take his/her first steps without support. (“baby steps”)

General

1x

6

- Encourage/help the child to stand without support.

8

- Encorage the child to get up and down the bed/sofa (feet first)

guidelines:

Perform activities once a day

12 Systematic Guidelines: appointment 10

At this period, when the child is already a little older, almost 18 months older, his/her personality starts to emerge. It is important to pay attention to these changes, because by getting to know the child's personality, family members can help the child to learn and develop in a more suitable way regarding the child's characteristics. Thus, in this activity, encourage the child to draw with crayons and play with modeling clay, respecting the natural preference of each child's way of being. It is necessary to understand the child's personality and reinforce each achievement with praise. Whenever the child makes a free drawing, ask them to explain what was drawn.

Playing with shape sorting box toys is essential in this period; it helps improve the ability to concentrate, especially if it has more complex pieces to fit. Play to construct towers helps to develop fine motor coordination and hand-eye coordination. When the child is able to sit up straight, he/she will also be able to form a tower with blocks. Between 14 and 16 months, the child will be able to stack three or four pieces; parents should demonstrate this activity previously, and with the child, they can play dismantle and rebuild the tower.

All activities proposed before, such as holding a spoon to eat and turn the pages of books freely telling stories (activities

Manual_E-BOOK.indd 88 26/10/2021 17:03:21

3 and 4), must be repeated insistently, continuously increasing the degree of difficulty. Learning must be organized, daily and along the months, but always observing the intuitive potential of each child. By "reading freely", the child creates their own stories, stimulating language development. Parents must show interest, encouraging them to read more, to improve the establishment of socio-affective development.

By encouraging free walking and getting up/down from the bed and sofa (activities 5 and 6), the mother and father reinforce the child's independence. It is vital to practice walk and the body's control when running; playing running (activity 8) and jumping in the same place, especially from 16 months of corrected age, is helpful to develop these skills. The gross motor activity that requires more care is climbing stairs, and parents should guide the child to do it safely with the support of one hand and one step at a time; always explain to the child the strategies used.

Parents must be reminded that cognitive development depends on motor skills; each motor task performed, following commands in an orderly manner, will also train attention, memory, ability to solve problems and develop reasoning. For example: by inviting the child to play kick a ball, providing guidance stimulates cognition (activity 9).

Manual_E-BOOK.indd 89 26/10/2021 17:03:21

A child who squats while playing will be more prepared to sit alone in a child seat. Parents should encourage certain squatting games until the child does so spontaneously. It is important to remember that all games and activities must be performed together, under parents supervision.

The development of the ability to focus on movements and sensations is achieved in these early stages of life. Although each child's rhythm must be respected, the parents' stimuli must be constant.

Manual_E-BOOK.indd 90 26/10/2021 17:03:21

10th appointment

Bond with your Toddler:

Sing to your baby • Imitate sounds and make faces

1

- Encourage the child to draw with crayons.
- Play with play dough.

3

- Encourage the child to hold a spoon to feed him/herself.

2

- Play with shape sorter toys.
- Build towers.

4

- Encourage the child to play with books and turn pages, tell stories.

5

- Encourage free walking.

7

- Encourage the child to go up and down the stairs holding hands.

9

- Encourage the child to throw and kick the ball.

General

1x

6

- Encourage the child to get up and down the bed/ couch.

8

- Play run.

10

- Encourage playing in a squat position.

guidelines:

Perform activities once a day

13 The impact of early stimulation on neurodevelopment

Preterm birth is considered a significant risk factor for delays and neurodevelopmental disorders in children. Pre, peri, and postnatal complications can directly result in brain damage, such as hemorrhage and periventricular leukomalacia, or indirectly due to the stress related to the necessary care in the NICU. Both directions have a negative impact and require attention and monitoring of these children's' neurodevelopment. Early stimulation in the hospital environment and guidance to caregivers to continue this care after hospital discharge is necessary to promote development.

The sooner an adequate stimulation routine is established by the family, the greater the benefits for the child, since it is a critical period, with rapid and relevant changes in all domains of development. The remarkable brain plasticity – the greater capacity of the nervous system to adapt and mold itself in its structural and functional organization in response to the action of environmental stimuli – enhances learning. Appropriate experiences early in life can alter the structure or function of the central nervous system.

Therefore, the quality of stimuli and experiences offered to the child at this period is essential to promote the acquisition of new skills and positively influence future life. With parental training by a multidisciplinary team, the early stimulation presented in this manual modified the experiences of children who participated

Manual_E-BOOK.indd 96 26/10/2021 17:03:23

in this program, minimizing the negative impact of the preterm' biological condition, promoting cognitive, motor, and language development. It is important to note that many preterm babies have subtle delays, and, as these difficulties are slight, they are often not considered, resulting in school difficulties and more impoverished motor repertoire at older ages. Thus, longitudinal assessment and guidance for early stimulation should occur for all children born preterm, regardless of the difficulties presented in early life.

The stimulation protocol presented in this manual was designed according to child development milestones, anticipating by one month the expected motor and cognitive stage of acquisition for the corrected age. In this manner, the children were challenged to acquire the following expected milestones, resulting in a remarkable exploration of environment and objects/toys. To measure the benefits of this program protocol, we systematically assess the child's developmental with standardized scales at four different times, at 4, 8, 12, and 18 months of life. These assessments measured cognitive (i.e., sensory-motor development, exploration and manipulation of objects, concept formation, memory, habituation, visual' acuity and preference, and object permanence), language (i.e., pre-verbal behavior, vocabulary development, identification of objects and figures, babble, gesture, first words), and fine and gross motor (perceptive-motor integration, motor planning, quality of movement in the prone, supine, sitting, and standing postures, hands' functional ability, static and dynamic balance) domains.

Manual_E-BOOK.indd 97 26/10/2021 17:03:23

These assessments allowed us to observe that the specific tasks and the different toys offered at each stage of stimulation helped increasing movement of lower and upper limbs, visual perception and identification of pictures and colors, allowing the development of aspects such as spatial and temporal memory and perceptions. The different positions in which parents were instructed to place the children during the daily routine promoted postural control, the transition from lower to higher positions, dislocation, and balance, convening the child with motor resources to explore the environment. Moreover, since the caregivers conductd the intervention, the interaction during early stimulation, which will be addressed in the next chapter, and the positive reinforcement of the child's achievements promoted social, emotional and language development.

Children who participated in the early stimulation program showed positive changes at different stages of development in all parameters assessed. It is important to emphasize that the effectiveness of the early stimulation program in the neurodevelopment of preterm infants was maintained at 18 months, in various parameters, even with the discontinuation of the intervention, showing the longitudinal effect of this protocol.

The results obtained allow us to reinforce the importance of the systematic evaluation of the preterm child's development to identify delays and disorders and assess the intervention's impact over time. With the longitudinal assessment, it is possible to identify which stage of development the infant is in and thus plan stimulation activities based on the skills already acquired,

Manual_E-BOOK.indd 98 26/10/2021 17:03:23

proposing challenges for acquiring more complex skills, according to the child's corrected age. Only through frequent assessments is it possible to monitor the child's evolution, identify difficulties, assess the impact of the stimulations offered and train parents to enhance their child's development. Furthermore, the knowledge and understanding that early stimulation is beneficial to neurodevelopment is vital strategy for health professionals to guide parents about the possibility of minimizing the impacts of prematurity on the infant's future life. Parents and caregivers of preterm children are often afraid to promote stimulating experiences since they perceive the child as fragile, especially those who stay long in the NICU. Health professionals who care for these children need to be aware of this apprehension of caregivers to guide, clarify doubts, and provide confidence and consequently promote the best opportunities to their children.

Manual_E-BOOK.indd 99 26/10/2021 17:03:23

14 The impact of early stimulation of mother-child interactions on family life

Cognitive, social, and motor development are interdependent during childhood, and the interaction between mother and child influences this process and promotes the child's compression concerning the world around him/her; this bond is essential to promote development. Therefore, the mother's availability and responsiveness to gestures, looks, smiles, and "child talks" promote increases in verbal communication and motor exploration, and consequently cognitive development. A mother sensitive to her child's demands safely promotes the child's freedom to explore her physical environment. The quality of interactions strengthens the child's attachment and relationship with the mother. The balance between venturing into exploratory behaviors and attachment with their mother promotes the acquisition of new skills to respond to the various demands of the environment in which he/she live.

Childhood competence, at first motor (e.g., picking up an object to play with; pulling oneself to stand using furniture; reaching an object; moving from one place to another using rolling, dragging, crawling, walking; and interacting), and cognitive (e.g., finding a hidden object; discerning different sounds and gestures; recognizing one's own body, people and objects; recognizing the consequence of their small actions) and social later - through language (e.g., doing vocalizations and babbling of different intensities; locating and imitating sounds; using isolated

Manual_E-BOOK.indd 100 26/10/2021 17:03:23

words that will be meaningful later; using words to express their thoughts) is promoted and mediated by the interaction with people who exercise parental role, usually the mother.

Therefore, to acquire the necessary skills and behavioral patterns to adapt to the environment, the child needs an accessible and responsible mother who uses reciprocal behavior to guide the child's behavior. The child's social competence depends primarily on the cooperation of his/her mother figure, which stimulates the child's effectiveness in his/her own mobility; controlling the exploration and actions on the environment – since f the first attempts to control the trunk to reach an object and even feeding independently. Recognizing that development is determined by the stimulation received, the complex interaction of the child with their caregivers, and the development opportunities offered at home, the methodology adopted in this protocol – centered on early stimulation of the preterm child – assumed the impact of this intervention on promoting the interactions of the mother with her/his child in different daily tasks.

We expected that the mother's training to stimulate her child, throughout the intervention process, would lead to greater competence in the mother-child dyads, resulting in a competent child adapted to his/her environment; and a reciprocally responsive mother in promoting adaptation and the development of the child. We accomplished this goal. When evaluating the mother-child dyads at the end of the first year of life, we examined the child's social competence during different daily care tasks. During these mother-child dyads, we observe the child's social competence concerning his/her (1) autonomy – the child's

Manual_E-BOOK.indd 101 26/10/2021 17:03:23

spontaneous attempts to initiate actions and interactions; (2) the child's responsiveness regarding maternal behavior – verbal and non-verbal; (3) the child's empathy regarding the mother's affective expressions – adjusting the behavior through gestures, smiles, and vocalizations; (4) the child's direct motor regulation for task execution – task-oriented attention and action; and, (5) the child's emotional regulation in a state of independent comfort and/or seeking comfort in their caregiver. At the end of the intervention, we observed a positive change in these parameters for all children who received early stimulation.

Furthermore, we also investigate the mother's behavior during these dyads. Therefore, we also assessed the mother's educational' competence during the daily routine. The mother respect and encouragement regarding several features such as (1) sensitivity to the child – positioning and seeking the child's attention before interacting; (2) response to the child – praising and smiling with non-verbal affective responses; (3) respect for the child's autonomy – taking breaks when the child is restless, not forcing the child limits, and allowing the child to adapt to the activities; (4) socio-emotional - encouraging, recognizing achievements, avoiding negative verbally and non-verbally behaviors; and (5) cognitive – describing, demonstrating, explaining and focusing the child's attention on different tasks. Similar to the changes observed in children, the mothers involved in the intervention program showed high levels of respect for the children's developmental and encouragement to the child acquire new skills.

Manual_E-BOOK.indd 102 26/10/2021 17:03:23

From the child's first attempts to elevate their head in prone position to the independent running, from discovering the body to symbolic thinking, from the initial forms of imitative language to the verbalization of thought - the emotional and verbal responsiveness of caregivers influences the child's development. By training parents to conduct the cognitive-motor intervention with their child, the interaction between them was strengthened, possibly influencing attachment as well. Promoting mother-child interaction, considering the attributes and characteristics of each one, reveals the available resources to enhancing child development, with relevant implications for families and professionals involved in childcare.

Manual_E-BOOK.indd 103 26/10/2021 17:03:23

Support reminder:

Your son or daughter is growing, and its personality is starting to show more and more. It is important to pay attention to these changes, by getting to know their children, parents can help them learn and develop better in their own way. If the child is calm and quiet, it may seem easier to take care of, but it is essential to remember that they also need attention, fun, and opportunities to develop. An child with a shy personality needs time to get used to new things, and attentive parents can help a lot, reassuring and showing security to learn to face new experiences independently. A restless child, on the other hand, needs the parents to be calm and patient.

The child's personality isn't formed yet, but that does not mean things will always be the same; personality is influenced by many events in life – the parents care is vital in this process. Due to a very preterm birth, the extended period in the hospital and he clinical outcomes reinforce the need stimulation with a lot of love and patience. We believe that with this simple guidebook, the family may be very successful.

Manual_E-BOOK.indd 104 26/10/2021 17:03:23